UNDERSTANDING
THE IMPLICATION (<=>) IN
CAUSE (C) if&onlyIF EFFECT (E)
{(C)<=>(E)}
FROM THE POINT OF VIEW OF
(S)=>(E)=>(N)
(N) NECESSARY Condition for (E)
{(N)<=(E)}
(S) SUFFICIENT Condition for (E)
{(S)=>(E)}

Non-existence of **{counter-example}** –

(01) ***you cannot have a situation where*** N doesn't exist but E exists.

[-{(-N)&(E)}]

(02) {E cannot exist without N} ⇔ {(N)<=(E)} ⇔ **{(-E)<=(-N)}**;

(03) ***you cannot have a situation where*** S exists but E doesn't exist.

[-{(S)&(-E)}]

(04) {S cannot exist without E} ⇔ {(S)=>(E)} ⇔ **{(-E)=>(-S)}**;

Use of **because-of / if** clause in usual conversation –

(05) **{(E)bcozof(S)}⇔{(E)<=(S)}**; {(-S)bcozof(-E)}⇔{(-S)<=(-E)};

(06) {(N)bcozof(E)}⇔{(N)<=(E)}; **{(-E)bcozof(-N)}⇔{(-E)<=(-N)}**;

Use of **only-if** clause in usual conversation –

(07) **{(E)only-if(N)}⇔{(E)=>(N)}**; {(-N)only-if(-E)}⇔{(-N)=>(-E)};

(08) {(S)only-if(E)}⇔{(S)=>(E)}; **{(-E)only-if(-S)}⇔{(-E)=>(-S)}**;

Use of **if&onlyIF** clause in usual conversation –

(09) **{(E)if&onlyIF(C)}⇔{(E)<=>(C)}**; **{(-E)if&onlyIF(-C)}⇔{(-E)<=(-C)}**;

Use of **in-spite-of** clause in usual conversation –

(10) **{(-E)inspiteof(N)}⇔{(-E)&(N)}**; {(N)inspiteof(-E)}⇔{(N)&(-E)};

(11) {(-S)inspiteof(E)}⇔{(-S)&(E)}; **{(E)inspiteof(-S)}⇔{(E)&(-S)}**;

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[{(X)&(Y)} & {(X)&(-Y)} & {(-X)&(-Y)} & {(-X)&(Y)}] means that
(X) and (Y) are logically independent/unrelated;
that is,
(Y) is neither necessary nor sufficient for (X).

[{(X) because-of (Z)} & {(-X) because-of (-Z)}
that is,
[{(X) <= (Z)}] & [{(-X) <= (-Z)}]
that is,
[{(X)<=(Z)}] & [{(X)=>(Z)}]
that is,
[{(X)<=>(Z)}] or equivalently [{(X)⇔(Z)}]
that is,
(Z) is both necessary cause as well as sufficient cause for (X).